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The relationship between sociodemographic factors and the snacking and drinking behaviours of children aged between 1 and 5 years in early years settings across Plymouth

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Abstract

Sugar consumption amongst children continues to sit above the current UK recommendations, contributing to rates of obesity and dental caries in this group. Previous research has focused on children of school age, investigating the role of parental income and education on child diet quality. The aim of this research was to assess the relationship between sociodemographic factors and the consumption of snacks and drinks by children between 1 and 5 years attending childcare settings across Plymouth. A questionnaire was distributed to settings to be filled out by parents/carers, measuring occupation, living situation and the number of children in the family, as well as consumption of drinks and snacks by children. Results found a significant difference in sugary drinks consumed per week between those with unemployed parents who were consuming an average of 12.70 portions per week and parents employed in highly skilled professions (4.24, p=0.019). Those with two other children were consuming less fruit/fruit products at 8 portions per week when compared to those with no other children (18.50 portions, p=0.045), one (17.48 portions, p=0.011) or three or more other children (27.10 portions, p=0.017). Mean portions of sugary drinks consumed were also higher in those children whose mothers were unemployed (11.89) compared to those employed (4.47, p=0.035). These findings suggest that family sociodemographic factors have a relationship with the consumption of fruit and sugary drinks by children aged between 1 and 5 years in Plymouth. Further research is needed to investigate how these characteristics may mediate a child's diet.

Keywords: Sugar consumption, snacking behaviours, drinking behaviours, children, sugary drinks, fruit, sociodemographic factors, diet.

Introduction

The National Child Measurement program for England in 2016-17 found that a quarter of children starting reception aged 4-5 were overweight or obese (NHS Digital, 2017). Similarly, an oral health survey of 5-year olds revealed that a quarter of children had tooth decay, with results suggesting that decay had appeared as early as 3 years old (Public Health England, 2018). This survey further revealed that 9 out of 10 of hospital tooth extractions were in those children aged 0-5 years and were due to factors that could have been preventable, highlighting just how important education around preventing such health problems is even at a young age. Free sugars are added to food products during production to enhance flavour, excluding those found naturally in fruit and milk (Erickson and Slavin, 2015). The latest National Diet and Nutrition Survey (NDNS) revealed that children's intake of free sugars has declined significantly over time, however the national average across all age and sex groups remains above the recommendation of less than 5% of total energy coming from free sugars in the diet (Public Health England, 2019). An increased consumption of free sugars above this value of 5% of total energy has been linked to an increased risk of non-communicable diseases such as obesity and poor dental health (Johnson et al, 2007; Burt and Pai, 2001). Also highlighted in the literature is the impact of residence on the prevalence of obesity and dental caries. NHS Digital (2017) reported that those children living in the most deprived areas of a region had an obesity prevalence that was more than double that of those living in the least deprived areas, which was mirrored in the prevalence of tooth decay where significant regional inequalities also remained (Public Health England, 2018).

This sociodemographic impact on diet has been widely researched in the literature. A study by Park et al (2016) investigated the added sugar intakes of US adults, considering the associations with sociodemographic factors such as age, income, education level and marital status. It was found that free sugar intake was higher in those that were younger, less educated and had a lower income, however data on children's diets was not collected and so not included in the analysis. Survey data from the latest NDNS suggested a strong association with differing income levels regardless of age, with fruit and vegetable and fruit juice consumption increasing with income, whereas sugar-sweetened beverages and total free sugar intake decreased with income status (Public Health England, 2019). Studies that focus on the diets of children have often included parental characteristics when assessing the impact of sociodemographic factors, for example Wu (2017) who examined the relationship between parental work characteristics and diet quality among pre-school children, with results suggesting that having one parent working non-standard working hours significantly increased the risk of the child not eating breakfast and consuming more unhealthy foods. Interestingly, if it was the mother working the long hours, there was more frequent consumption of unhealthy foods compared to healthy foods (Wu, 2017). This family set up of mothers returning to work earlier after having children to provide financial stability is becoming more common in the UK, with 65.1% of mothers whose youngest child is a toddler in employment (Office for National Statistics, 2017). Similarly, being married was associated with a significant increase in daily fruit intake and decrease in sugary drinks consumption in 7-8-year-old children (Petrauskienė, Žaltauskė and Albavičiūtė, 2015). The age of family members has also been suggested to impact sugary drink consumption in children under 2 years, with studies suggesting a higher risk of these drinking behaviours if adults are over the age of 65 years, producing an adjusted odd's ratio (OR) of 3.10,

as well as an association with the number of family members in the household (OR = 1.05) (Jaime, Prado, and Malta, 2017). While the risk of sugary drink consumption increased by 3.1% with older age of adult in the household, the 1.05% increase with the overall number of family members is interesting as the authors did not include individual number of children in their analysis. There appears to be a gap in the literature surrounding the inclusion of the number and age of other children in the family, as well as the relationship between these factors and consumption of sugary snacks rather than sugar sweetened beverages alone.

Diet quality during the early years is crucial to ensuring adequate long-term health and development of a child, as well as being a critical period for the formation of food acceptance patterns that can be taken into adulthood to form healthy habits (Cashdan, 1994). A study by Rogers et al (2010) investigating the diets of children in Bristol found that increased total and animal protein and overall higher energy intakes at 3 years of age were positively associated with early onset of menarche at puberty, which can further increase the risk of breast cancer and osteoporosis. Nyaradi et al (2016) found that an overall higher diet quality at one-year of age was associated with increased academic achievement, particularly higher consumption of dairy at ages one, two and three years, and higher fruit consumption at age one year. An earlier prospective cohort study by Nyaradi et al (2013) found that, based on reported foods eaten at ages one, two and three years, an increased fruit consumption was positively associated with cognitive testing scores at a 10-year follow up. However, sugar-sweetened beverage consumption was negatively associated with cognitive ability, further suggesting the importance of early intervention of dietary habits that may be detrimental to later health (Nyaradi et al, 2013). Sugar-sweetened beverage consumption has been the focus of many early years dietary investigations, with findings indicating that of those consuming these drinks on four to six occasions per week between meals at ages 2.5 years, 3.5 years, and 4.5years, 15.4% were overweight or obese at 4.5 years when compared to 6.9% in those that were non-consumers, suggesting sugar-sweetened beverage consumption between meals more than doubled the risk of obesity in the early years (Dubois et al., 2007). Therefore, it is important to highlight the areas of concern in a city so that those most at risk of poor health can be identified and the appropriate support can be provided. Similarly, the appropriate service providers can be identified to see if more support could be offered by childcare settings to promote long-term health beyond the early years.

The aim of this study was therefore to explore the relationship between sociodemographic factors and the snacking and drinking behaviours of children between the ages of 1 and 5 years attending early years settings across Plymouth by use of a food frequency questionnaire. Based on the literature in this area, multiple sociodemographic factors will be explored, including whether the parent/carer is a single parent or living with a partner, their skill level and occupational status, the number of other children in the family and the age of the oldest child, in relation to the child's snacking and drinking behaviours. More specifically, there will be a focus on the sugar-containing snacks and drinks consumed by children in this age group.

Methodology

Subjects

Ethical approval was granted by the University of Plymouth Faculty of Science and Engineering Research Ethics & Integrity Committee before commencement. Subjects were eligible if aged between 1 and 5 years, attending a childcare setting in Plymouth and had a parent or carer in attendance to complete the study for their eldest child in this age range. Managers of childcare settings were approached to volunteer to participate via an email sent by professionals working within the early years department at Plymouth City Council, and a questionnaire was developed to assess both diet and relevant sociodemographic characteristics (appendix 1). The researcher attended some stay and play sessions at children's centres and drop off periods at nurseries, whereas other settings preferred to distribute questionnaires by sending a copy home with children for parents/carers to complete. Information around any healthy eating promotion that the childcare settings currently had in place was also collected from the managers or through direction to their website for consideration.

Dietary assessment

The children's' diet was assessed via a food frequency section asking parents/carers about snacking and drinking behaviours. The food frequency questionnaire (FFQ) was adapted from the European Prospective Investigation into Cancer and Nutrition (Riboli and Kaaks, 1997). The response period was revised from 'usual consumption in the last year', to 'consumption in a usual week' due to the rapid dietary changes that children in this age group may go through. Participants tallied their child's consumption of various snacks and drinks by scoring never or less than once a month, 1-3 per month, once per week, 2-4 per week, 5-6 per week, once a day, 2-3 per day, 4-5 per day, 5-6 per day, 6+ per day. Food items were chosen based on popular items consumed by children in the target age group, with portion sizing altered to reflect the amounts that they would usually consume. Attached to the questionnaire was a portion size guide developed using household measures and popular branded food items to help with completion of accurate estimations of diet. Researcher support was provided for help with filling out the questionnaire accurately in those early years settings where the researcher was present.

Sociodemographic factors

Questions for the sociodemographic categories were developed with input from professionals working with early years settings at Plymouth City Council and were made up of two sections; questions about the child and siblings and questions about the parents. To assess the family's current living situation, questions about the number of other children in the family were included, as well as their ages and information about other adults living in the house (with partner or single parent). Parental occupation was included in the questionnaire, however questions relating to income, working hours and education level were excluded due to professionals' advice suggesting these questions were too sensitive for the target population. Family postcode was included to gage the spread of responses across Plymouth. An additional question asking where parents/carers obtained advice around their child's diet was also added to establish which services were being used.

Statistical analysis

Following data collection, the parent/carer occupations listed were grouped using the standard classification of occupations and then split further to determine those that were unemployed or had a skill level of 2 or 4 for analysis, using the same classification system to interpret skill level (International Labour Office, 2012). For this sample, skill level 2 consisted of those in elementary occupations, clerical support workers, craft and trades workers, service and sales workers, and those in skill level 4 were managers, professionals or in armed forces occupations. Skill levels 1 and 3 were excluded from the analysis as there were no responses from parents/carers working within these categories.

Responses for snacking and drinking behaviours were coded to represent weekly consumption of each item (Never = 0, 1-3 per month = 0.5, Once a week = 1, 2-4 per week = 3, 5-6 per week = 5.5, Once a day = 7, 2-3 per day = 17.5, 4-5 per day = 31.5, 5-6 per day = 38.5, 6+ per day = 42). Food items were grouped for analysis to give an overall weekly frequency of items of interest to focus on the portions of items containing sugar consumed weekly by the child. Biscuits, sweets, cakes, ice cream, mousse and chocolate bars were grouped as sweet treats, and fruit, fruit pouches, fruit roll and dried fruit were grouped as fruit and fruit products. Sugary squash, fruit shoots and fizzy drinks were grouped under the heading sugary drinks. Due to very small consumption of sausage rolls, samosas, breadsticks, crackers, tea, coffee and energy drinks by the subjects, these items were excluded from the analysis. Data was statistically analysed using Minitab® Statistical Software (Minitab, LLC, USA). The Kruskal-Wallis rank test was used to determine differences in weekly consumption of sweet treats, sugary drinks and fruit and fruit products according to sociodemographic factors by producing a mean rank score for non-parametric data. A Mann-Whitney test was chosen to compare differences between two independent groups within categories with non-parametric data.

Results

Subject characteristics

Of the 60 subjects, 14 were recruited from children's centres, whereas 46 were from a range of nurseries. The sociodemographic characteristics of the sample are shown in table 1. Children had a mean age of 3.13 years, with 33.3% having parents that were unemployed. 73.3% of parents were living with their partner, whereas 21% were single parents. There was a wide spread of respondents across Plymouth, with the largest response from PL1 (figure 1).

Table 1: Sociodemographic characteristics of the sample (*n* = 60).

	%	Mean	SD
Child age (*years*)		3.13	1.04
Number of children in the family		1.05	1.13
Relationship (*Mother*)	80.0		
Relationship (*Father*)	16.7		
Living situation (*with partner*)	73.3		
Living situation (*single parent*)	21.7		
Employment status (*unemployed*)	33.3		
Employment status (*employed skill level 2*)	35.0		
Employment status (*employed skill level 4*)	31.7		
Mother's employment status (*employed*)	60.4		

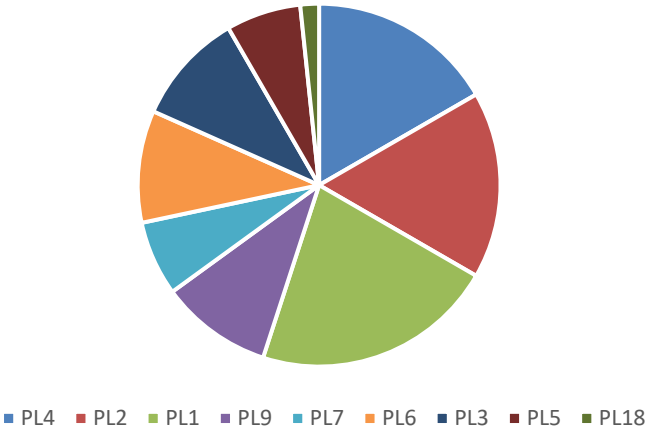

Figure 1: The distribution of participants' family postcode across Plymouth.

Table 2: Mean portions of individual snacks and drinks consumed per week by participants identified in the food frequency questionnaire (n=60).

Snacks and drinks	Mean portions per week	SD
Fruit	13.70	8.77
Rolled, dried and pouched fruit	4.23	5.40
Yoghurts	8.23	7.02
Biscuits	4.90	4.88
Sweets	1.50	1.87
Cakes	2.06	2.10
Ice cream	1.03	1.48
Mousse	0.49	1.28
Chocolate bar	2.33	2.31
Water	13.26	11.37
Sugary squashes	2.86	7.15
Low-sugar squash	11.86	14.06
Fizzy drinks	0.18	0.76
Smoothies	0.59	0.31
Milkshake/hot chocolate	1.31	2.64
Pure fruit juice	1.29	1.78
Milk	10.81	9.51

Fruit and fruit products

Mean portions of individual snacks consumed can be found in table 2. All participants were consuming a portion of fruit at least 3 times per week, with an average consumption of 13.7 portions per week. The mean portions of combined fruit and fruit products consumed per week according to sociodemographic factors are displayed in table 3. A Kruskal-Wallis test showed that there was a statistically significant difference in mean portions of fruit and fruit products consumed per week depending on the number of children in the family ($p=0.027$), with a mean weekly consumption of 18.50 portions if there were no other children, 17.48 portions for one other child, 8.00 portions for two other children and 27.10 portions if there were three or more children in the family. There were no further statistically significant differences found between the portions of fruit and fruit products when considering the age of the oldest child, the parental skill level or living situation.

Sweet treats

A variety of snacks containing sugar were included in the FFQ, with the mean portions of each presented in table 2. 31% of participants were consuming biscuits at least once a day, whereas the average consumption of sweets was 1.5 portions per week. Participants reportedly consumed an average of 1.03 portions of ice cream and 2.33 small chocolate bars per week. The mean portions of combined sweet treats consumed per week according to the sociodemographic factors are presented in table 3. There were no statistically significant differences between consumption of sweet treats when considering parental skill level, living situation, number and age of other children in the family or mother's employment status. There was a mean weekly consumption of 8.23 portions of yoghurt across the participants, however separate testing was performed on the portions of yoghurt consumed per week by

the participants compared to living situation, parental skill level, number and age of other children in the family, showing no statistically significant differences.

Sugary drinks

Mean portions of individual drinks consumed can be found in table 2. Water consumption amongst the population was high, with 71.67% drinking at least one 150ml glass per day, which was comparable to milk consumption that saw 73% including at least one daily glass in their diet. Sugar-free alternatives were also a popular choice, with the average weekly consumption of low-sugar squash equating to 11.86 glasses per week. The mean portions of sugary drinks consumed per week were calculated and displayed according to sociodemographic factor in table 3. It was found that 70% of participants were consuming sugary squash and fizzy drinks at least 1-3 times per month, with 27% of the children included in the study having at least one glass of a sugary drink per day. There was a statistically significant difference in mean portions of sugary squashes and fizzy drinks consumed per week between differing parental skill levels ($p=0.025$), with a mean weekly consumption of 12.70 portions for those that were unemployed, 5.21 portions for those with skill level 2 and 4.24 portions for those with skill level 4.

As 80% of the parents/carers that completed the questionnaire were mothers of the children, the employment status of the mother could be included in the analysis, for which it was found that there was a statistically significant difference in mean portions of sugary squashes and fizzy drinks consumed per week between maternal employment categories ($p=0.035$), with a mean weekly consumption of 11.89 portions if the mother was unemployed and 4.47 portions if employed. However, there were no further significant differences between portions per week with living situation and number of other children in the family. There was a general trend within sugary drinks consumption that saw decreases in portions per week with increasing age of the oldest child in the family, however this was not statistically significant.

Number of other children in the family and fruit/fruit products

Using the significant results from the Kruskal-Wallis testing, further differences between individual categories were also tested using separate Mann-Whitney analysis. A statistically significant difference was found between the portions of fruit and fruit products consumed per week depending on the number of other children in the family, with those with two other children in the family consuming the lowest amount of fruit and fruit products with a mean of 8.00 portions per week when compared to those with no other children ($p=0.045$), one other child ($p=0.011$) and three other children ($p=0.017$) in the family. There were no statistically significant differences when comparing the remaining groups (figure 2).

Parental skill level and sugary drinks

Further significant differences were found between the portions of sugary drinks consumed per week depending on parental skill level, with those with parents that were unemployed consuming significantly more sugary drinks when compared to those that were employed with the highest skill level of 4 ($p=0.019$). However, the differences between consumption in the unemployed group when compared to the skill level 2 group were not statistically significant, nor was the difference between skill level 2 and skill level 4 (figure 3).

Table 3: Mean portions of fruit and fruit products, sweet treats and sugary drinks consumed by participants according to sociodemographic factors

	Mean portions of food or drink per week		
Sociodemographic factors	**Fruit and fruit products**	**Sweet treats**	**Sugary drinks**
Skill level			
Unemployed (n=20)	19.15	13.55	12.70
2 (n=21)	18.60	12.93	5.21
4 (n=19)	15.00	10.29	4.24
p for heterogeneity	0.532	0.668	0.022*
Living situation			
With partner (n=44)	17.56	12.45	7.85
Single parent (n=16)	17.88	11.88	6.16
p for heterogeneity	0.867	0.960	0.874
Number of other children in family			
0 (n=18)	18.50	11.14	4.67
1 (n=31)	17.48	11.29	9.48
2 (n=6)	8.00	10.75	3.50
3+ (n=5)	27.10	24.60	9.00
p for heterogeneity	0.027*	0.210	0.382
Age of other children			
<5 years (n=18)	17.06	10.83	10.64
5-10 years (n=17)	17.44	13.50	8.26
>10 years (n=7)	17.43	16.14	4.00
p for heterogeneity	0.848	0.386	0.378
Mother's employment status			
Unemployed (n=19)	18.89	12.92	11.89
Employed (n=29)	18.12	11.64	4.47
p for heterogeneity	0.891	0.752	0.032*

*p=<0.05

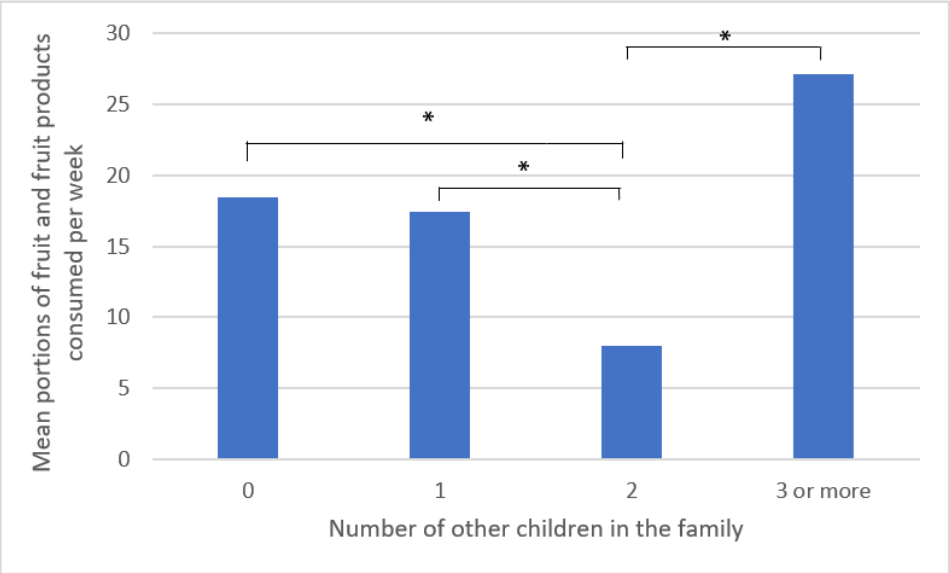

Figure 2: The mean portions of fruit and fruit products consumed per week by the participant in relation to the number of other children in the family. *p=<0.05.

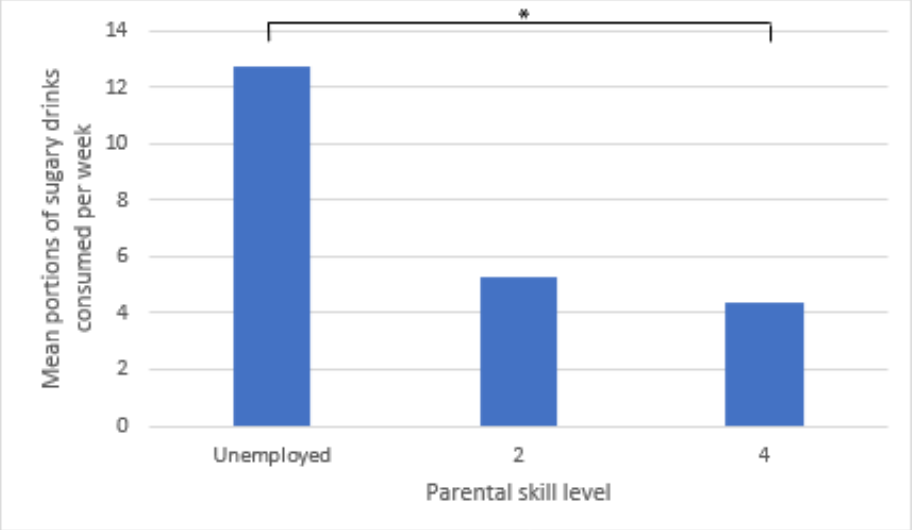

Figure 3: The mean portions of sugary drinks consumed per week by the participant in relation to the parental skill level. *p=0.019.

Parents were asked to state where they would go to get advice around their child's diet. 40% of parents/carers reported reaching out to family/friends for advice, rather than a health visitor (11.7%), GP/nurse (10%) or early years professional (11.7%). 15% did report use of a children's centres for advice, whereas 11.7% said they relied on the internet for such questions. Table 4 shows the healthy eating policies that are already promoted within each of the nurseries and children's centres that the participants were attending.

Table 4: The healthy eating promotion currently in place at each of the early year settings across Plymouth.

Early years setting	Healthy eating promotion
Devonport children's centres	Weigh-in sessions where parents can seek advice from a health visitor regarding child's diet, including resources available on healthy meal planning, weaning and fussy eating.
City centre and Plymstock nursery	Children only given milk or water throughout the day. All food provided at the nursery is outsourced by a company that provide nutritious, balanced meals. Occasionally, children have a go at cooking to take home or share with their friends.
Plympton and Widewell nursery	'Healthy eating project' - fruit and vegetable patches in the garden where children go to pick their own snacks for breaktime. Aim is also to engage the families to encourage them to replicate healthy lifestyle at home.
St Budeaux nursery	Healthy lunchbox ideas on website with top tips for healthy swaps as well as links to the Change 4 Life and NHS websites for parents to gain more information.
Ham nursery	Put a particular focus on making meal-times within the nursery 'social occasions' to encourage a healthy diet.

Discussion

The current study found that if parent/carer of the child assessed was unemployed, there was a significantly higher consumption of sugary drinks by the child per week when compared to those parents that were in the highest skill level of profession. Furthermore, there was a significant increase if it was the mother specifically that was unemployed. The study also found there to be a significant decrease in the portions of fruit and fruit products consumed by the participant if there were two other children in the family, when compared to those that had no other children, one other child or three or more children. The present study compared the age of the oldest child within the family; however, no significant relationships were found when comparing intakes of sugary drinks, sweet treats or fruit and fruit products.

The study measured weekly consumption of fruit/fruit products, sweet treats and sugary drinks as indicators of free sugar consumption. The mean consumption of fruit per week for the participants was 13.70 portions, which is below the UK recommendation of 5 portions of fruit and vegetables a day, however vegetable intake was not considered in the present study (World Health Organisation, 2004). The Health Survey for England (2018) found that only 18% of children aged between 5 and 15 were consuming 5 portions of fruit and vegetables a day, and although data was not available for children younger than this, the current study may indicate that children are leaving the early years and starting primary school with below optimal intakes. Comparison of the participants' free sugar intake was harder to compare to national recommendations, however, the average consumption of sugary drinks across the participants was 7.10 portions per week which indicates children in this sample were consuming at least one sugary drink per day. In a report on free sugar intake by the Scientific Advisory Committee on Nutrition (SACN) it was revealed that sugar-sweetened beverages accounted for 16% of total free sugar intake for children aged between four and ten, for which this age group are still consuming above the

UK recommendations of less than 5% of total energy (Public Health England, 2015). The impact of these types of dietary patterns on early years health has been studied by Keller et al (2009), who found that increased sugar-sweetened beverage consumption by 3 to 7-year olds had displaced milk drinks, as well as being inversely associated with vitamin D and calcium consumption. However, the current study found that 73% of participants were still consuming one glass of milk per day on top of sugary drink consumption, so may be unlikely that milk drinks have been replaced in this cohort.

High skill level of the parent, relating to occupation and employment status, was found to have a significant relationship leading to lower consumption of sugary drinks per week by the child which is consistent with other studies in the literature. The most recent NDNS found that with increasing income, the percentage of children aged 4 to 10 years consuming sugar-sweetened soft drinks decreased significantly (Public Health England, 2019). Whilst the current study did not measure income of the parent, it was found that those children with at least one parent who was unemployed, and therefore may have a decreased household income, there was a significant increase in the portions of sugary drinks consumed per week. Similarly, Vereecken et al (2009) found that in those children that were from a lower sociodemographic status, specifically relating to education level and occupation of the parent, there was a higher consumption of sugary drinks when compared to those from a higher socioeconomic status. The current study also found this relationship to be significant when considering maternal employment status alone, however Chun-Li Wu (2018) found that mother's working hours had an impact on the diet quality of children. Similarly, Cawley and Liu (2012) observed a rise in childhood obesity that coincided with a rise in women in work, with working mothers spending 17 minutes less per day cooking and 4 minutes less per day grocery shopping. This may be contradictory to the current findings that suggest lower sugary drink consumption in mothers who were employed compared to unemployed, with no significant differences between fruit consumption and sweet treats. However, diet as a whole was not recorded in the current study, only snacking and drinking behaviours, which may have provided a more detailed analysis of overall diet quality.

There are few existing studies investigating the impact of family size on the snacking behaviours of young children, with the most widely researched factors being parental involvement, meal-time habits and role-modelling behaviour in the consumption of fruit and vegetables in the early years (Attorp et al, 2014). Although the current study does not show causality, previous studies have explored reasons why a child's diet may change according to these factors. (Ohly et al, 2013) investigated parental food involvement (FI) and found that FI score was significantly higher for parents with fewer children and that parental FI was strongly correlated with consumption of fruits and vegetables. The present study suggested that those with no other children or one other child in the family had a higher fruit and fruit product consumption compared to those that only had two other children, with the results from Ohly et al (2013) suggesting this could be explained by a decrease in parental involvement through lack of food shopping, cooking and preparation. However, this was not the case for those with three or more children, although this could be due to the small sample size within categories. North and Emmett (2000) studied a large sample of 3-year old children as part of the Avon Longitudinal Study of Pregnancy and Childhood (ALSPAC), with results suggesting a diet of 'convenience foods' was associated with

the presence of older siblings in the family, whereas a more traditional diet of meat and vegetables was associated with having no older siblings. The present study supported this in the finding that those with two other siblings were consuming significantly lower portions of fruit/fruit products, indicating a decreased preference for the healthier snacking choice, whereas those with no or one other sibling were consuming higher amounts. There was also a general trend that supported the findings by North and Emmett (2000) who suggested a role-modelling effect with older siblings, showing that with increasing age of the oldest sibling in the family, there was increased consumption of sugary drinks per week. However, this trend was not statistically significant.

The highest percentage of parents reported relying on family and friends (40%) or the internet (11.7%) to gather advice around their child's nutrition, with smaller proportions suggesting that they would seek help from a professional, for example a health visitor, nurse or children's centre staff. Ohly et al (2012) investigated the demand from parents for more healthy eating support for their children, revealing that 38% of parents, particularly those with lower socioeconomic status, were interested in education in budgeting, food preparation and advice around fussy eating. Results from the current study suggest that there is a relationship between family sociodemographic characteristics and the consumption of sugary drinks and fruit/fruit products, and so the implications of this may be that targeted education and signposting to the correct professional may be beneficial for those that fall within these demographics and are not already reaching out to services regarding their child's nutrition. All childcare settings included in the study had pre-existing healthy eating promotion of various design, which could be an interesting area of future research to determine why parents are not reaching out to these professionals for advice around their child's diet.

The main limitation of the study was the methodology used to measure dietary habits across 1 to 5-year olds, which was chosen to lower the response burden for the parents approached, however it was not without its limitations. The FFQ used in this research adapted from EPIC (Riboli and Kaaks, 1997) has shown underreporting of energy intake by around 22%, although it was concluded as having acceptable relative validity (Kroke et al, 1999). One advantage of this type of assessment is that individual dietary components can be pinpointed, in this case sugar, however a previous study by Aranceta et al (2003) looking at diet quality included a comprehensive list of foods that gave a detailed overview of total dietary intake which the current study lacks, leading to a less accurate representation of overall sugar content including foods not only classed as 'drinks' or 'snacks'. Parents/carers were approached directly to complete a questionnaire in three of the childcare settings, which could cause researcher bias in this sample rather than in the remaining settings where questionnaires were sent home for them to complete. However, in these circumstances, the researcher was not present to ensure that the questionnaires were filled out correctly which may lead to some inaccuracies in their answers. Parents were also filling out information on the diets of the children who were all attending a childcare setting. Therefore, they may have limited opportunity to observe their child's eating habits and so some underreporting may be present. Similarly, the FFQ section could be open to social desirability bias by the parents wanting the diets of their child to appear acceptable, which could have led to underestimated strength of the relationships found in the study (Pabayo et al, 2012).

The study was also limited in its sample size due to a lack of time and resources, which meant some items were excluded from analysis as there was not enough data to hold enough statistical power. Included in this was separate analysis between children's centres and individual nurseries to look for differences in their snacking and drinking behaviours, which would be an interesting area to research in further study with a larger sample size. Similarly, a larger sample size would allow family residence to be included in final analysis, which would be an interesting area to further this study by looking at differences in snacking and drinking patterns in early years across the city.

Conclusions

In conclusion, the findings from the current study indicate that family sociodemographic factors have a relationship with child snacking and drinking habits, particularly the involvement of parental employment status and the number of other children in the family on the consumption of fruit/fruit products and sugary drinks, more so than 'sweet treat' food items. Further research is needed to consider confounding variables and to understand the mechanisms behind how these factors may affect diet in the early years to ensure enough support is provided during the years where dietary habits are formed. The findings from this type of study may aid public health professionals in developing interventions to ensure diet during the early years is optimal for long-term good health.

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